

BEE VISITATION AND POD SETTING IN *BRASSICA CAMPESTRIS* L.¹

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(With two text-figures)

Key words: Bee visitation, *Brassica campestris*, pod setting.

Studies were conducted on visitation behaviour of *Apis mellifera* L., *A. dorsata* F. and *A. florea* F. and number of *A. mellifera* visits on pod setting on BSH-1 variety of *Brassica campestris* L. var. brown sarson at Ludhiana during 1989-90. *A. dorsata* had longer active hours among the three bee species. *A. florea*, *A. dorsata* and *A. mellifera* visited 6.05, 12.89 and 17.06 flowers of this crop per minute, respectively. Single, double and multiple visits by *A. mellifera* resulted in 45.7, 72.5 and 81.6% pod setting.

INTRODUCTION

Brassica crops were grown in an area of 5 x 10⁶ ha in India during 1989-90 with a production of 4.1 x 10⁶ tonnes (Anon., 1990-91). *Brassica campestris* L. var. brown sarson is a cross-pollinated crop. Mahindru (1990) reported four species of bees viz. *Apis dorsata* F., *A. florea* F., *A. mellifera* L. and *Andrena* sp. associated with this crop at Ludhiana. Intensive pollination of this crop by *A. mellifera* resulted in the increase of pod setting by 29.3%, number of pods by 21.9%, seed germination by 2.85%, and oil content by 1.28% over natural pollination. In view of the benefits obtained by cross pollination of this crop by *A. mellifera*, it was considered desirable to study the visitation behaviour of important pollinating bees associated with brown sarson and number of *A. mellifera* visits on pod setting, as there is considerable scope of increasing the yield of this crop with the help of insect pollinators. The results are reported in this paper.

MATERIAL AND METHODS

Studies on visitation behaviour of important pollinating bees of *B. campestris* L. var. brown sarson were carried out at the

Entomological Research Farm, Punjab Agricultural University, Ludhiana (30°-55° 'N Lat. 75°-51° E long. 247 metres above msl) and other fields around Ludhiana during 1989-90 on BSH-1 variety of brown sarson.

Population of *A. mellifera*, *A. dorsata* and *A. florea* were counted at hourly intervals, starting from 0900 to 1700 hrs on five clear, calm days by using the method of Linsley *et al.* (1952). For this purpose 10 sq. m (3.16 x 3.16 m) area was marked at random in the field with sticks. The area was divided into four subplots. Observations on all the sub-plots were made by moving anticlock-wise. The number of bees counted in all the four sub-plots were then added to work out their total number. The total duration for which these bees worked in the field was also recorded separately for each species. To ascertain the number of flowers visited per minute, individual bees were followed in the field for the maximum possible time. The number of flowers visited in one minute was then worked out. The average figures were calculated on the basis of observations recorded for 10 different foragers of the same species.

The relationship between bee visit and pod setting was studied by bagging flowers when they were yet to open and *A. mellifera* had not yet started visiting them. Next day, the bags were removed from the flowers and number of

¹Accepted February, 1997

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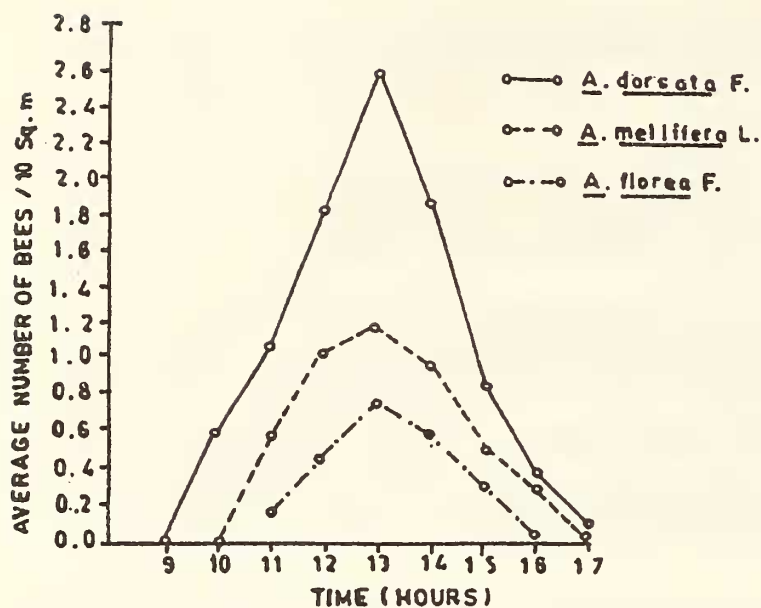


Fig. 1: Mean bee visitation at different hours of the day

A. mellifera visits were counted i.e. 1.2 and 5 per flower were allowed. Pod setting was observed after one week. Pod setting in 'control' flowers was also noted where no bee visit was allowed. These observations were repeated on five different dates viz. Jan. 26, Feb. 2, Feb. 11, Feb. 21 and Feb. 28, 1989.

RESULTS AND DISCUSSION

Bee visitation: It was observed that *A. dorsata* visited the crop between 9-17 h, *A. mellifera* between 10-17 h and *A. florea* between 11-16 h. The data further revealed that the number of all the three species of bees present in the field increased between 12-14 h with peak activity at 13 h (Fig. 1). Kakkar (1981) reported that activity of honeybees was higher between 12-14 h on cauliflower. Rahman (1940) found that on sarson *A. florea* began their visits after 11 h and were mostly present in the field upto 16 h. The present study on sarson revealed that all the three species of bees were present in higher numbers between 12 and 14 h with a peak at 13 h. Their number was considerably lower before 12 and after 15 h.

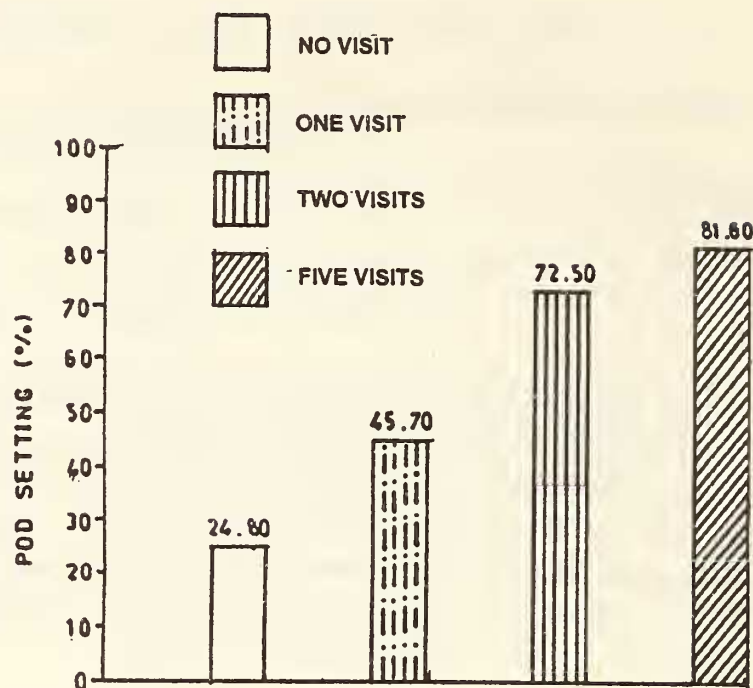


Fig. 2: Effect of number of *A. mellifera* visits on pod setting

Number of flowers visited per minute: The average number of flowers visited per minute was observed, to assess the species' potentiality to affect cross-pollination. It was observed that *A. florea* on an average visited 6.05 flowers per minute, whereas *A. dorsata* and *A. mellifera* visited 12.89 and 17.06 flowers per minute, respectively. *A. mellifera* was found to be the most fast moving. It visited a significantly greater number of flowers per minute as compared to *A. dorsata* and *A. florea* at mean temperature 12°C.

Benedeck *et al.* (1972) reported honeybees visiting 39 rape flowers during a period of 4.4 minutes. Bhalla *et al.* (1983) noticed *A. cerana indica* visiting 10.24 flowers per minute on *B. campestris* var. sarson. Rahman (1940) reported that *A. florea* visited an average of 6.09 flowers of sarson in one minute. Our investigations revealed that *A. florea* visited the least number of flowers per minute, whereas *A. mellifera* was found to be the most efficient and quick moving pollinator.

Relationship between bee visit and pod setting : Zero, one, two and five *A. mellifera* visits per flower resulted in 24.80, 45.70, 72.50 and 81.60% pod setting, respectively (Fig. 2). It

was observed that with increase in the number of bee visits per flower, there was significant increase in pod setting. Grewal (1975) reported that five bee visits per flower in *Cucurbita pepo* L. and ten bee visits per flower in *Cucumis melo* L. gave adequate fruit setting. Free (1970) reported that more than one bee visit per flower was necessary to transfer a sufficient number of pollen grains to pollinate muskmelon satisfactorily. Girish (1983) found that with the increase in bee visits from 1 to 7 per flower, the fruit setting increased significantly in *C. pepo*. The present investigation also revealed that in

sarson, with increase in the bee visits of *A. mellifera* from 1 to 5, higher pod setting was achieved. The presence of an increased number of honeybees was thus more useful in sarson.

ACKNOWLEDGEMENT

We thank the Head, Department of Entomology, PAU for providing research facilities. The senior author is also grateful to Aspee Research Foundation, Mumbai for providing financial assistance during the study.

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